

ADDENDUM NO. 2  
TO  
PLANS AND SPECIFICATIONS  
FOR  
NEW KA‘Ū DISTRICT GYMNASIUM AND SHELTER  
AT KA‘Ū HIGH AND PĀHALA ELEMENTARY SCHOOL CAMPUS  
JOB NO. B-4108  
PĀHALA, KA‘Ū, HAWAI‘I  
COUNTY AND STATE OF HAWAII

**NOTICE TO ALL PROSPECTIVE BIDDERS**

The items listed below are made a part of the current contract and shall govern the work, taking precedence over the previously issued specifications and drawings governing the particular item of work mentioned.

**NOTICE TO BIDDERS**

The bid opening date is postponed from May 24, 2012 to June 7, 2012 at 2:00 p.m. Bids received after the time fixed for opening will not be considered.

Paragraph 5 of the Notice to Bidders is revised by **deleting** the following: “; the conference shall be the only venue in which the list may be discussed, and if necessary, modified. Failure to attend the conference shall be evidence that the bidder/offeror has opted to not provide input on the listing and waive all future rights to protest the requirements resulting there from.”

**Delete** Notice to Bidders, page 2 in its entirety and **replace** with the revised Notice to Bidders page 2. (1 page attached).

**PRE-BID CONFERENCE**

The following attached documents summarize discussions and clarifications provided during the Pre-Bid Conference conducted on Tuesday, May 8, 2012 for the project.

1. Pre-Bid Conference Agenda/Meeting Minutes (2 pages attached).
2. Pre-Bid Conference Attendance Sheet (2 pages attached).

QUESTION: Who is responsible for installation of the new poles in the state property (if covered under HELCO's facilities scope)?

RESPONSE: New poles work is currently being discussed with HELCO, as such a definitive response is pending (to be addressed in up-coming addendum).

### **SOILS REPORT**

The Foundation Investigation Report for Ka'ū Gymnasium Pāhala, Ka'ū, Hawai'i, TMK: 9-6-05:08 and 39, dated April 9, 2012, prepared by Hirata & Associates, Inc. is attached (42 pages).

### **CHANGES TO DRAWINGS:**

The following drawings dated 5/9/2012 and identified as Revision No. 2, revise portions of previously issued drawings as indicated:

#### **CIVIL:**

Item No.	Description
C-1.1	SHEET C-1.1: Revised Construction Notes 1
C-1.2	SHEET C-1.2: Revised Construction Notes 2
C-2.0	SHEET C-2.0: Revised Demolition Plan
C-3.0	SHEET C-3.0: Revised Overall Site Plan
C-3.1	SHEET C-3.1: Revised Partial Site Plan 1
C-3.2	SHEET C-3.2: Revised Partial Site Plan 2
C-6.0	SHEET C-6.0: Revised Erosion Control Plan
C-6.1	SHEET C-6.1: Revised Erosion Control Details
C-10.1	SHEET C-10.1: Revised Site Details
C-10.2	SHEET C-10.2: Revised Parking Details
C-10.3	SHEET C-10.3: Revised Trash Enclosure Details
C-10.4	SHEET C-10.4: Revised Miscellaneous Site Details 1
C-10.5	SHEET C-10.5: Revised Miscellaneous Site Details 2
C-10.6	SHEET C-10.6: Revised Fence Details
C-10.7	SHEET C-10.7: Revised Utility Details
C-10.8	SHEET C-10.8: Revised Drainage Details 1
C-10.9	SHEET C-10.9: Revised Drainage Details 2
C-10.10	SHEET C-10.10: Revised Sewer Details

#### **LANDSCAPE:**

Item No.	Description
L-1	SHEET L-1.1: Revised Copper Pipe to HDPE.
L-2	SHEET L-2.1: Revised plant type and locations per comments.
L-3	SHEET L-2.2: Omit header detail.

#### KITCHEN:

Item No.	Description
K-1	SHEET K-1 EQUIPMENT PLAN: Relocated Item No. 3 Pot Sinks.
K-2	SHEET K-1 EQUIPMENT PLAN: Item No. 5 Ice Machine, Changed to “N.I.C. FUTURE”.
K-3	SHEET K-1 EQUIPMENT PLAN: Item No. 6 Front Service Counter, added over shelf.
K-4	SHEET K-2 EQUIPMENT ELECTRICAL PLAN: Revised to reflect relocation of Item No. 3 Pot Sinks.
K-5	SHEET K-2 EQUIPMENT ELECTRICAL PLAN: Revised electrical schedule of Item No. 5 Ice Machine to read “FUTURE-CAPPED”.
K-6	SHEET K-2 EQUIPMENT ELECTRICAL PLAN: Revised location of convenience outlet at Item No. 6 Front Servicing Counter.
K-7	SHEET K-3 EQUIPMENT MECHANICAL PLAN: Revised to reflect relocation of Item No. 3 Pot Sinks.
K-8	SHEET K-3 EQUIPMENT MECHANICAL PLAN: Revised mechanical schedule of Item No. 5 Ice Machine to read “CW FUTURE-CAPPED”.
K-9	SHEET K-4 EQUIPMENT BUILDING WORK PLAN: Updated base background and relocated Item No. 3 Pot Sinks.
K-10	SHEET K-5 ELEVATIONS & SECTIONS: Indicated Item No. 5 to “N.I.C. – FUTURE”.
K-11	SHEET K-5 ELEVATIONS & SECTIONS: Added elevation & section for overself addition to Item No. 6 Front Service Counter.
K-12	SHEET K-6 ELEVATIONS & SECTIONS: Revised to indicate relocation of Item No. 3 Pot Sinks.
K-13	SHEET K-8 TYPICAL DETAILS: Revised backsplash detail to indicate continuous caulking at wall.

#### STRUCTURAL:

Item	Description
S-1	SHEET S-1.1: Added Note 13.
S-2	SHEET S-1.1: Added Mechanical Equipment Pads.
S-3	SHEET S-1.1: Clarified site retaining wall.
S-4	SHEET S-1.1: Revised curb at parking.
S-5	SHEET S-1.1: Omit depressed floor designation in Storage Room.
S-6	SHEET S-1.1: Revised column and footing at grid lines C/12 and J/12 from C4 to C3 and F-6.0x8.0 to F-6.0.
S-7	SHEET S-1.1: Revised window and door openings at exterior wall to match architectural.
S-8	SHEET S-1.1: Revised exterior sidewalk extent.
S-9	SHEET S-1.2: Omit depressed floor designation in Janitor Room.
S-10	SHEET S-1.2: Added depressed floor designation for aluminum grating at entry and at A.D. Office.
S-11	SHEET S-1.2: Revised crack control joint pattern at Exterior Courtyard.

- S-12 SHEET S-1.7: Clarified planter and bench seating. Added detail targets 5,6,7/S-4.2.
- S-13 SHEET S-1.7: Added ramp detail target 8/S-4.2.
- S-14 SHEET S-1.7: Added Mechanical Equipment Pad.
- S-15 SHEET S-1.7: Added shear wall designation to interior wall at grid line G/7.
- S-16 SHEET S-1.7: Added holdowns to exterior walls.
- S-17 SHEET S-1.7: Added holdown requirement to shear wall legend note.
- S-18 SHEET S-1.8: Added detail targets at eaves, 13/S-10.1.
- S-19 SHEET S-1.8: Added note for typical window and door header schedule.
- S-20 SHEET S-1.8: Relocated girder truss.
- S-21 SHEET S-1.8: Added truss over shear wall. Added target 16/S-10.1.
- S-22 SHEET S-1.8: Added fastening requirements for plywood roof sheathing.
- S-23 SHEET S-4.2: Added detail 5/S-4.2 – Exterior Bench Section.
- S-24 SHEET S-4.2: Added detail 6/S-4.2 – Exterior Bench Section.
- S-25 SHEET S-4.2: Added detail 7/S-4.2 – Planter wall Section.
- S-26 SHEET S-4.2: Added detail 8/S-4.2 – Section through ramp.
- S-27 SHEET S-5.1: Revised detail A/S-5.1 – from CMU to Concrete retaining wall.
- S-28 SHEET S-10.1: Added detail 12/S-10.1 – Box Stud Header Schedule.
- S-29 SHEET S-10.1: Added detail 13/S-10.1 – Typical Eave Section.
- S-30 SHEET S-10.1: Added detail 16/S-10.1 – Truss/Shear wall connection detail.

#### MECHANICAL:

- | Item No. | Description   |
|----------|---|
| M-1      | SHEET M-1,M-3,M-4, M-5, M-6, M-16, M-17, M-18, M-19, M-20, M-21, M-23, M-24, FP-2: Revised. |
| M-2      | SHEET M-2: EF-1 & 2: Revised area served.   |
| M-3      | SHEET M-2: EF-5, 6, 8, 9 & 10: Revised Remarks column.                                      |
| M-4      | SHEET M-2: EF-11: Revised fan.  |
| M-5      | SHEET M-2: EF-12: Added fan.  |
| M-6      | SHEET M-2: SF-7 thru 12: Added fans   |
| M-7      | SHEET M-2: SF-1: Revised fan.   |
| M-8      | SHEET M-2a, M-11a: New Sheet.   |
| M-9      | SHEET M-2a: Renamed Relief Hood to Exhaust Hood.  |
| M-10     | SHEET M-2a: Revised RH to EH.   |
| M-11     | SHEET M-2a: Revised EH-6.   |
| M-12     | SHEET M-2a: Added EH-7.   |
| M-13     | SHEET M-7: Removed boundary around Parks & Rec's Dir. Off..                                 |
| M-14     | SHEET M-7: Added boundary around Court 1 main gym.  |
| M-15     | SHEET M-7: Added boundary around Court 4 of main gym.                                       |
| M-16     | SHEET M-8: Revised EF-11 duct size.   |
| M-17     | SHEET M-8, M-10: Added ductwork for gym ventilation.  |
| M-18     | SHEET M-8: Located gym HVAC control panel to elec. Rm.                                      |
| M-19     | SHEET M-11: Added EF-12.  |

- M-20 SHEET M-11: Deleted floor plan.
- M-21 SHEET M-12: Revised tag from RH to EH.
- M-22 SHEET M-12: Added EH.
- M-23 SHEET M-12, M-13: Added supply fan.
- M-24 SHEET M-14: Revised vent size.
- M-25 SHEET M-22: Revised notes.
- M-26 SHEET M-22: Added detail.
- M-27 SHEET FP-3: Removed detail.

#### ELECTRICAL:

SHEET E-1: Revised Courtyard and Parking Lot lighting, Deleted PB#2 and Revised Communication Duct routing to Rm A146 and Kau High School Administration Building, Moved HELCO service pole line into County property, Added note that overhead primary line extension to pad mounted transformer to be constructed by HELCO.

SHEET E-2: Details 1/E-2 and 8/E-2 have been revised to move DT SW to the loading dock area, Detail 4/E-2 – Contractor to adjust concrete pad height to accommodate slope, Detail 5/E-2 – Added Elevation.

SHEET E-3:

- a. Lighting Plan – Multipurpose Bldg
  - i. Added Type K Light Fixtures on North and South Side of Multipurpose Building
  - ii. Changed Surface mounted Light Fixtures to Pendant type in Rms B102, B103, B104, B105 & B108.
- b. Power and Communication Plan – Multipurpose Bldg
  - i. Moved ACCU-1
  - ii. Moved receptacle and data outlets on East side of Rm B101
  - iii. Moved receptacle and data outlets on West side of Rm 101
- c. Fire Alarm Plan – Multipurpose Bldg
  - i. Added FA pullstations on North side of Rm 101.

SHEET E-4: Revised Branch Circuiting.

SHEET E-5: Revised Branch Circuiting.

SHEET E-6:

- a. Revised Lighting in Rms A127, A129, A100, Court
- b. Added EF-12 in Rm A119

SHEET E-7: Revised Lighting in Rooms A130, A132, A133, and Court.

SHEET E-8: Added SF-7 through SF-12.

SHEET E-9 and E-10: Added FA Strobes.

SHEET E-11:

- a. Revised FA Riser Diagram to reflect changes on FA plan.
- b. Revised Communication and CATV Wiring Diagram

SHEET E-12:

- a. Panel Schedules and Light Fixture Schedule have been revised.
- b. Detail 2/E-12 has been revised to CAT 6
- c. Detail 3/E-12 has been added to drawings

**SHEET E-13:**

- a. Detail 1/E-13 – Added cover plate on pole base. Changed galvanized anchor bolts to stainless steel
- b. Added Details 2/E-13 and 3/E-13



Warren H. W. Lee, P.E., Director  
Department of Public Works  
County of Hawai'i

Date Issued: May 11, 2012

Please detach and execute the receipt below. Return immediately via facsimile (808) 961-8630 or mail to the Administration Office, Department of Public Works, County of Hawai'i at Aupuni Center, 101 Pauahi Street, Suite 7, Hilo, Hawai'i 96720-4224.

-----  
Receipt of Addendum No. 2 via website for NEW KA'Ū DISTRICT GYMNASIUM AND SHELTER, Job No. B-4108, Pāhala, Ka'ū, Hawai'i, is hereby acknowledged.

Signed: \_\_\_\_\_

Title: \_\_\_\_\_

Firm: \_\_\_\_\_

Date: \_\_\_\_\_

charge to the individual or company. Any additional compact discs will be provided, to the same individual or company, upon receipt of TWENTY-FIVE DOLLARS (\$25.00) per compact disc, in cash or in the form of a certified check, cashier's check, or company check, made payable to the County of Hawai'i, Director of Finance, which will be **non-refundable**.

Prospective Bidders shall use the printed proposal provided by the Department of Public Works and submit their bid proposal in a sealed envelope.

Any addenda, if issued for said project, will **only** be available on the State Procurement Offices' website <http://hawaii.gov/spo/notices>.

Prospective Bidders must file with the Director of Public Works their "Intent to Bid." The Prospective Bidder's Intent to Bid must be received at the Administration Office, Department of Public Works no later than ten (10) calendar days prior to the bid opening date. If the tenth day is on a Saturday, Sunday, State holiday or a County of Hawai'i Furlough day, the Intent to Bid is due on the next working day following the due date. The Intent to Bid form is available at the Administration Office, Department of Public Works, Phone: (808) 961-8321 and for electronic download at the Department of Public Works' website: <http://www.hawaiicounty.gov/bids-proposals-contracts>.

All prospective bidders/offerors are invited to attend a pre-bid conference to be held on May 8, 2012 at 1:00 p.m. at the County of Hawai'i, Aupuni Center, Aupuni Center Conference Room, 101 Pauahi Street, Hilo, Hawai'i 96720-4224. Attendance at the pre-bid conference is not a condition for submitting a bid. Subcontractors and union representatives are invited, but not required to attend. The conference is to provide bidders/offerors with an opportunity to ask questions about the contractual requirements and all technical aspects of the project. The conference will also address the minimum subcontractor listing requirements for the project.

**NEW KA'Ū DISTRICT GYM AND SHELTER**  
**Job No. B-4108**  
**Pre-Bid Conference**

May 8, 2012, 1:00 pm at Aupuni Center Conference Room  
Aupuni Center, 101 Pauahi St., Hilo, Hawaii 96720

**AGENDA/MINUTES**

1. Introduction:
  - A. Project Coordinator: Noland Eskaran / DPW Building Division
  - B. Contractors: (self introduction)
2. Dissemination of Information:
  - A. Pre-Bid Agenda.
  - C. Sign-in sheet (ensure that all attendees sign in).
3. Licensing Requirements: See "Special Notice to Bidders" and "Minimum Contractor License Requirements for Project" form, concurrence / acceptance by pre-bid conference attendees of listing (per note #4) is needed. To assure that all required subcontractor licenses are listed, these same licenses are now indicated on bid proposal.
4. Successful project contractor shall provide schedule of value (SOV) / bid breakdown (according to specification sections).
5. Intent to Bid / Hawaii Products Preference: **Last day to file is May 14, 2012** (unless bid opening is postponed).
6. Properly executed and notarized 'Standard Qualification Questionnaire for Offerors' form provided by the Department of Public Works is **required to be filed by May 22, 2012 2:00pm** for evaluation (if such form has not been filed or up-dated within the prior 12 months). Contact: Administration Office, Department of Public Works, Ph. (808) 961-8321 if you're unsure.
7. COH Furlough Schedule (Fiscal Year 2012 – 2013);
  - A. Copy of the schedule is provided in the specifications, contractors are urged to arrange work schedule / crucial inspections accordingly.
8. Contract Time / Anticipated Project Commencement:
  - A. Contract time: **550 consecutive calendar days** (no deductive time for deductive alternates).
  - B. Anticipated contract start date: **Mid - June, 2012**. As such COH will need the contractor's full cooperation to help expedite contract (timely submission of all required commencement documents).
9. Liquidated Damages: Liquidated damages amount shall be \$1,350.00 per consecutive calendar day(as set forth in the General Requirements and Covenants of the County of Hawaii (July, 1972). All bidders are hereby advised that liquidated damages (LD's) shall be assessed for the contractor's failure to complete the project, in it's entirety (including submission and acceptance of all closing documents).

10. Bidders are reminded of requirement to abide with HRS, Chapter 103B – Employment of State Residents of Construction Procurement Contracts (as amended, by Act 192, SLH 2011)
11. Request for Information / Request for Substitution (RFI / RFS) will be received up to Monday, May 14, 2012. Requests submitted after this date will not be answered (assuming bid opening @ 5/24/12) all RFIs and RFSs shall be sent via e-mail, fax or mailed as follows;
  - [neskaran@co.hawaii.hi.us](mailto:neskaran@co.hawaii.hi.us) (office ph. 961-8468)
  - Fax; (808) 961-8410)
  - COH / DPW / Aupuni Center / Noland Eskaran / Projects Coordinator  
101 Pauahi Street, Suite 7  
Hilo, Hawaii 96720
12. COH's project consultants are in discussion with utilities (ie; HELCO, Hawaiian TelCom, Dept of Water Supply, Gas Co. and Oceanic Cable), any facilities charges shall be paid for directly by the COH. Contractor / bidder is reminded that they shall help coordinate and provide full cooperation with all utilities. The COH shall not be held responsible for any costs and or delays caused by utilities work.
13. Addendum #1 consisting of 4 – 8.5" x 11" sheets and 55 full size drawing sheets was posted to the web site 5-7-12 (late in the day) and Addendum #2 expected to post on 5-9-12 (unknown how many sheets).
14. Contractors are also reminded that State wage rates shall apply on this project. Payroll reports will be needed for weekly submittal from the prime and subcontractors, three (3) sets (1 original and 2 copies required).
15. So as to assure that everyone gets the same response information, all questions should be via RFI process. Previously requested RFIs are being worked on and will be forthcoming in the upcoming addendum #2.

Thank you for your attendance!

16. Meeting Minutes:

Meeting commenced at 1:10 p.m.

Questions and or comments as follows:

1. Is contractor responsible for the new utility poles, or is this part of HELCO facility charges? This is to be clarified in up-coming addendum.
2. Noland Eskaran, Building Division, Project Coordinator's Phone No. (808) 961-8468.

The meeting concluded at 1:24 p.m.

New Ka`ū District Gymnasium and Shelter

Job No. B-4108

Tuesday, May 8, 2012 at 1:00 p.m.

County of Hawai`i

Aupuni Center

Aupuni Center Conference Room

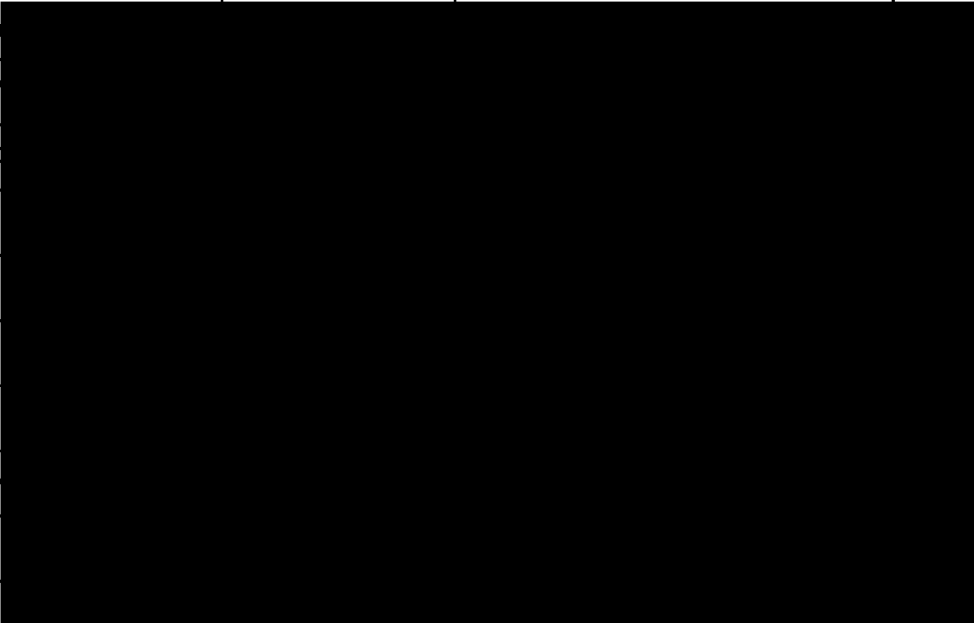
101 Pauahi Street

Hilo, HI 96720-4224

Pre-Bid Conference Attendance Sheet

Name	Organization	Address	Telephone	Fax No.	Email Address
LEIGHTON (WASAKI)	NANE Inc.	636 LAUMAKA ST. Hono			
DAN ZISCHKE	BUCK ROOFING CO. INC.	P.O. Box 1799 Hono Kailua HI			
NUSI TUKUAFU	JACOBSEN CONSTRUCTION CO.	P.O. Box 1749 KEA'AH, HI			

New Ka'ū District Gymnasium and Shelter  
 Job No. B-4108  
 Tuesday, May 8, 2012 at 1:00 p.m.  
 County of Hawai'i  
 Aupuni Center  
 Aupuni Center Conference Room  
 101 Pauahi Street  
 Hilo, HI 96720-4224  
 Pre-Bid Conference Attendance Sheet

Name	Organization	Address	Telephone	Fax No.	Email Address
Aaron Castillo	A.C. EXCAVATORS	510 AWEKA ST. Hilo			
Jesse Bongallian	Constructors Hi Line	180 Kalamkon St. Hilo			
GERARD YAMADA	GW CONSTRUCTION	16-212 Melickahine Pl Kaanapali, HI 96749			
Katie Klein	DOZ	ST. BURY			
LESLIE ISEMOTO	ISEMOTO CONTR.	648 PILANI HILLO			
DWAYNE TANATA	ISEMOTO CONTR	"			
JAMES KOMATA	COH-DPR				
LINCOLN KALANNA	WEST HAWAII CONCRETE	P.O. BOX 1309 KAILUA-KONA			
ROBERT CANTYNE	WHC				



Hirata & Associates

Geotechnical  
Engineering

Hirata & Associates, Inc.

99-1433 Koaha Pl  
Aiea, HI 96701  
tel 808.486.0787  
fax 808.486.0870

April 9, 2012  
W.O. 12-5268

Mr. Chad McDonald  
Mitsunaga & Associates, Inc.  
747 Amana Street, Suite 216  
Honolulu, Hawaii 96814

Dear Mr. McDonald:

Our report, "Foundation Investigation, Ka'u Gymnasium, Pahala, Ka'u, Hawaii, TMK: 9-6-05: 08 and 39," dated April 9, 2012, our Work Order 12-5268 is enclosed. This investigation was conducted in general conformance with the scope of services presented in our proposal dated November 9, 2011.

The surface soil consisted of brown clayey silt derived from volcanic ash. Although the clayey silt/volcanic ash encountered in our borings appeared to be in a firm to medium stiff condition, laboratory testing indicated high compressibility characteristics. Underlying the surface volcanic ash at depths ranging from about 6 inches to 4.5 feet was gray, slight to moderately weathered basalt. The basalt was in a medium hard to hard condition and extended to the maximum depths drilled. A cavity was encountered within the basalt stratum in a boring at depths of about 11 feet, extending down to 14 feet.

Conventional spread footings founded on the medium hard to hard basalt are recommended for support of the proposed structures. An allowable bearing value of 6,000 pounds per square foot may be used for foundation design. Due to the potential lava tubes, cavities, and voids in the basalt stratum, we recommend that a probing and grouting program be implemented during construction of the foundations. In addition, the surface clayey silt/volcanic ash at the building areas should be completely removed and, if required, replaced with imported non-expansive, granular structural fill.

Additional geotechnical recommendations are presented in this report. We appreciate this opportunity to be of service. Should you have any questions concerning this report, please feel free to call on us.

Very truly yours,

HIRATA & ASSOCIATES, INC.

Paul S. Morimoto

President

PSM:CCT

## TABLE OF CONTENTS

INTRODUCTION .....	1
PROJECT CONSIDERATIONS .....	2
SITE CONDITIONS .....	2
SOIL CONDITIONS .....	2
CONCLUSIONS AND RECOMMENDATIONS .....	4
Foundations .....	5
Probing and Grouting .....	5
Seismic Design .....	6
Lateral Design .....	6
Foundation Settlement .....	7
Slabs-on-Grade .....	7
Light Pole Foundations .....	7
Pavement Design .....	8
Percolation Test Results .....	9
Site Grading .....	9
ADDITIONAL SERVICES .....	11
LIMITATIONS .....	11

## APPENDICES

### APPENDIX A

Description of Field Investigation .....	Plates A1.1 and A1.2
Location Map .....	Plate A2.1
Boring Location Plan .....	Plate A2.2
Boring Log Legend .....	Plate A3.1
Unified Soil Classification System .....	Plate A3.2
Rock Weathering Classification System .....	Plate A3.3
Boring Logs .....	Plates A4.1 through A4.9
Dept. of Health Site Evaluation/Percolation Test Forms .....	Plates A5.1 and A5.6

### APPENDIX B

Description of Laboratory Testing .....	Plate B1.1
Consolidation Test Report .....	Plate B2.1
CBR Test Reports .....	Plates B3.1 and B3.2

**FOUNDATION INVESTIGATION****KA`U GYMNASIUM****PAHALA, KA`U, HAWAII****TMK: 9-6-05: 08 AND 39****INTRODUCTION**

This report presents the results of our foundation investigation performed for the proposed gymnasium at Ka`u, Hawaii. Our services for this study included the following:

- A visual reconnaissance of the site to observe existing conditions which may affect the project. The general location of the project site is shown on the enclosed Location Map, Plate A2.1.
- A review of available in-house soils information pertinent to the site and the proposed project.
- Drilling and sampling 9 exploratory borings to depths ranging from about 14.5 to 24.5 feet. A description of our field investigation is summarized on Plates A1.1 and A1.2. The soils encountered are described on the Boring Logs, Plates A4.1 through A4.9. The approximate exploratory boring locations are shown on the enclosed Boring Location Plan, Plate A2.2.
- Conducting falling head percolation tests in 6 test holes drilled to depths of about 5 feet. The approximate test hole locations are shown on Plate A2.2. Test results are presented on Plates A5.1 through A5.6.
- Laboratory testing of selected soil samples. Testing procedures are presented in the Description of Laboratory Testing, Plate B1.1. Test results are presented on the Boring Logs (Plates A4.1 through A4.9), Consolidation Test report (Plate B2.1), and CBR Test reports (Plates B3.1 and B3.2).
- Engineering analyses of the field and laboratory data.
- Preparation of this report presenting geotechnical recommendations for the design of foundations, seismic considerations, slabs-on-grade, resistance to lateral pressures, flexible pavement, and site grading.

Hirata & Associates, Inc.

## **PROJECT CONSIDERATIONS**

Information regarding the proposed project was provided by personnel from your office.

The project includes a Gymnasium building and a Recreation/Multi-Purpose building. The Gymnasium will have plan dimensions on the order of 226 by 190 feet; the Multi-Purpose building will have plan dimensions of about 50 by 102 feet. Both structures will be one story in height. We assume that the structures will utilize masonry and/or reinforced concrete construction with concrete slabs-on-grade.

The project will also include parking areas along the south and east sides of the proposed Gymnasium building, as well as additional parking area southwest of the proposed Gymnasium, near Hapu Street.

## **SITE CONDITIONS**

The project site is located in the southeastern section of Ka'u High and Pahala Elementary School Campus in Ka'u, Hawaii. The site is bordered by the Weight Room Building on the northwest, tennis courts on the west, and residential buildings on the south.

The site is presently an open area, used as a soccer field. Drainage over the site generally flows in a southeasterly direction.

## **SOIL CONDITIONS**

The surface soil at the site consisted of brown clayey silt, derived from volcanic ash. Although the clayey silt/volcanic ash encountered in our borings appeared to be in a firm to medium stiff condition, laboratory testing indicated high compressibility characteristics. Volcanic ash is also characterized by high moisture content, low density, and poor workability.

Hirata & Associates, Inc.

Underlying the surface soil at depths ranging from about 6 inches to 4.5 feet was gray, slight to moderately weathered basalt. The basalt was in a medium hard to hard condition, and extended to the maximum depths drilled. A cavity was encountered within the basalt stratum in boring B1 at depths of about 11 to 14 feet.

Neither groundwater nor seepage water was encountered in the borings.

## **CONCLUSIONS AND RECOMMENDATIONS**

From a geotechnical viewpoint, it is our opinion that the site can generally be developed as planned, and conventional shallow foundations may be used to support the proposed structures.

Due to its moderate to high compressibility and poor workability, the surface clayey silt/volcanic ash within the building areas should be completely removed and, if required, replaced with imported non-expansive, granular structural fill.

Lava tubes, cavities, and voids can be expected in the basalt formation. We understand that previous construction at the school campus encountered lava tubes. A geophysical survey of the school campus performed by Geolabs Hawaii in 1998 indicated that subsurface anomalies, detected by ground penetration radar, existed in the northeastern section of the project site. The subsurface anomalies, believed to be potential lava tubes, generally trended in a northwest-southeast direction, crossing below the proposed Recreation/Multi-Purpose building footprint, and the northeast corner of the proposed Gymnasium. According to Geolabs' geophysical survey, the depth to the top of the anomalies is expected to be about 10 to 15 feet at the proposed Recreation/Multi-Purpose building site, and about 15 to 20 feet at the northeast corner of the proposed Gymnasium site.

Our boring B1, drilled at the northeast corner of the Recreation/Multi-Purpose building, encountered a cavity at a depth of about 11 feet, extending to a depth of about 14 feet. The other boring drilled at the Recreation/Multi-Purpose building site, as well as borings drilled at the Gymnasium site, did not encounter cavities/voids in the basalt stratum down to the maximum depths drilled.

As a precautionary measure, we recommend that a probing and grouting program for the building foundations be implemented during construction. The bottom of all wall

and column footing excavations should be probed to depths at least twice the footing width or to a minimum of 10 feet, measured from the bottom of footing elevation. All probed holes should be filled with sand-cement grout.

### **Foundations**

Conventional spread footings founded on the medium hard to hard basalt may be used to support the proposed structures. Foundations may be designed for an allowable bearing value of 6,000 pounds per square foot. This allowable bearing value is for the total of dead and frequently applied live loads, and may be increased by one-third for short duration loading which includes the effect of wind and seismic forces.

Spread footings should be a minimum 16 inches in width and embedded at least 6 inches into basalt. In addition, footings located on, or near the top of slopes, should be embedded such that a minimum horizontal distance of 5 feet is maintained between the bottom edge of footing and slope face.

The bottom of all footing excavations should be cleaned of loose material prior to placement of reinforcing steel and concrete.

### **Probing and Grouting**

A subsurface probing and grouting program is recommended as part of the site preparation work for the building foundations. All footing excavations should be probed with a pneumatic drill or air-track hammer. Probe holes should be drilled at the center of each column footing and at 10-foot on centers along wall foundations. Additional probe holes may be required if large cavities or voids are encountered. The probe holes should be a minimum 2 inches in diameter, and extend to depths at least two times the width of the footing or to a minimum 10 feet below the bottom

of footings. Placement of temporary thin wall plastic pipe in the probe holes may be necessary to prevent holes from caving.

All probe holes should be filled with low pressure grout discharged through a grout pipe starting at the bottom of the probe hole. The grout should consist of a sand cement grout, consisting of about one part cement to three parts sand. Areas which encounter large or numerous cavities which consume a large quantity of grout may require additional probe holes.

### **Seismic Design**

Based on the boring drilled as part of this study and our knowledge of the deep soil conditions in the area, the subsurface soils can be characterized as a rock profile. Therefore, based on the 2009 International Building Code, Site Class B is recommended for this site.

### **Lateral Design**

Resistance to lateral loading may be provided by friction acting at the base of foundations, and by passive earth pressure acting on the buried portions of foundations.

A coefficient of friction of 0.45 may be used with the dead load forces for foundations founded directly on basalt. Passive earth pressure may be computed as an equivalent fluid having a density of 200 pounds per cubic foot for the onsite clayey silt/volcanic ash, or 400 pounds per cubic foot for basalt. Unless covered by pavement or concrete slabs, the upper 12 inches of soil or basalt should not be considered in computing lateral resistance.

For active earth pressure considerations, equivalent fluid pressures of 40 and 55 pounds per cubic foot may be used for freestanding and restrained conditions,

respectively. To prevent buildup of hydrostatic pressures, weepholes or subdrains should be included in the design of all retaining structures.

### **Foundation Settlement**

Settlement of foundations bearing on medium hard to hard basalt is expected to be negligible.

### **Slabs-on-Grade**

As previously indicated, the onsite surface clayey silt/volcanic ash within the building areas should be completely removed and, if necessary, replaced with imported granular structural fill.

To provide uniform support, all building slabs-on-grade should be underlain by a 4-inch cushion of clean gravel, such as #3 Fine (ASTM C33, Size No. 67). The gravel cushion should be compacted to a level surface using a vibratory compactor. Building slabs should also be protected by a vapor barrier.

Slabs-on-grade which will receive floor covering should include control joints saw-cut into the concrete slab. The purpose of this recommendation is to help reduce the potential for reflective cracking of the floor covering due to shrinkage cracks in the concrete slab. Proper curing of the concrete slab will help reduce shrinkage cracking.

### **Light Pole Foundations**

Either spread footings or drilled pier foundations may be used to support the proposed light poles. The spread footings and drilled pier foundations may be designed using recommendations presented in the *Foundations*, *Seismic Design*, and *Lateral Design* sections of this report.

In addition, frictional resistance between the concrete shaft of drilled pier foundations and the surrounding soils or basalt may be considered in the design of drilled pier foundations, provided the concrete is poured neat against the drilled hole. Adhesion values of 500 and 2,000 pounds per square foot may be used in determining the additional load capacity due to friction for drilled shaft/pier embedded in clayey silt/volcanic ash and basalt, respectively. The upper 2 feet of embedded drilled pier foundation should not be considered in determining the load bearing capacity due to friction.

### **Pavement Design**

The following flexible pavement section is recommended for parking and driveway areas generally limited to passenger vehicles and light trucks.

2.0"	Asphaltic Concrete
6.0"	Aggregate Base Course (minimum CBR of 80)
18.0"	<u>Aggregate Subbase (minimum CBR of 25)</u>
26.0"	Total Thickness

Fire lanes may be designed based on the following section.

3.0"	Asphaltic Concrete
6.0"	Aggregate Base Course (minimum CBR of 80)
18.0"	<u>Aggregate Subbase (minimum CBR of 25)</u>
27.0"	Total Thickness

Overexcavation of hard basalt for placement of the subbase will not be required. The base course and subbase should be compacted to a minimum 95 percent compaction as determined by ASTM D1557. Where applicable, the subgrade should be compacted in order to provide uniform support. Due to the relatively high in-situ moisture contents and the poor workability associated with volcanic ash, compaction of the onsite clayey silt to the conventional 90 percent compaction will be difficult. In lieu of this, we recommend a minimum compaction standard for the subgrade soil, equivalent to 100 percent of the wet density determined at the soil's in-situ moisture content.

### **Percolation Test Results**

Six percolation test holes were drilled and tested in the proposed parking areas. All test holes extended to depths of about 5 feet.

Test holes P1 through P4 encountered basalt at depths ranging from about 1.5 to 4.5 feet. Test holes P5 and P6 encountered basalt gravel and cobbles at depths of about 1 and 2.5 feet. In general, the percolation rate of the basalt depends on the degree of fractures in the basalt rock, as well as the amount of clinker pockets and cavities within the basalt layer. As a result, the percolation rates of basalt can vary significantly between test holes. Test results are presented on the Department of Health Site Evaluation/Percolation Test forms, Plates A5.1 through A5.6.

### **Site Grading**

**Site Preparation** - The project site should be cleared of all vegetation, including tree roots, and other deleterious material.

Due to its moderate to high compressibility and poor workability, the surface clayey silt/volcanic ash in the building areas should be completely removed prior to placement of structural fill.

Prior to fill placement in non-building areas, the existing ground should first be scarified to a depth of six inches and recompact before fill placement. Due to the relatively high in-situ moisture contents and the poor workability associated with volcanic ash, compaction of the onsite clayey silt to the conventional 90 percent compaction will be difficult. In lieu of this, we recommend a minimum compaction standard for the subgrade soil, equivalent to 100 percent of the wet density determined at the soil's in-situ moisture content in areas exposing the clayey silt/volcanic ash at subgrade level.

Scarification and recompaction of the exposed basalt will not be required prior to placement of new fill. If encountered during grubbing operations or site preparation, cavities and voids should be exposed and properly backfilled with compacted fill or controlled low strength material (CLSM).

**Structural Excavations** - Based on our exploratory test borings, we believe that excavations into the onsite clayey silt can be accomplished with conventional excavating equipment. Excavation extending into the underlying medium hard to hard basalt will require pneumatic equipment, especially for confined excavations such as footing excavations and utility trenches.

Temporary cuts in the clayey silt should be stable at gradients of 1:1 (horizontal to vertical) or flatter for temporary conditions. Cuts in medium hard to hard basalt may stand at near vertical for temporary conditions. However, the contractor should be responsible for conforming to OSHA safety standards for excavations.

**Onsite Fill Material** - The surface clayey silt/volcanic ash will not be acceptable for reuse in structural fills and backfills. The excavated slight to moderately weathered basalt may be reused in compacted fills provided the material is crushed to a 3-inch minus, well-graded consistency.

**Imported Fill Material** - Imported structural fill should be well-graded, non-expansive granular material. Specifications for imported granular structural fill should indicate a maximum particle size of 3 inches, and state that between 8 and 20 percent of soil by weight shall pass the #200 sieve. In addition, the plasticity index (P.I.) of that portion of the soil passing the #40 sieve shall not be greater than 10. Imported structural fill should have a CBR expansion value no greater than 1.0 percent and a minimum CBR value of 15 percent, when tested in accordance with ASTM D 1883.

**Compaction** - We anticipate that most of the fill material for this project will be granular in nature. Granular structural fill should be placed in horizontal lifts restricted to eight inches in loose thickness and compacted to at least 95 percent compaction as determined by ASTM D 1557.

Fill placed in areas which slope steeper than 5H:1V should be continually benched as the fill is brought up in lifts.

### **ADDITIONAL SERVICES**

We recommend that we perform a general review of the final design plans and specifications. This will allow us to verify that the foundation design and earthwork recommendations have been properly interpreted and implemented in the design plans and construction specifications.

For continuity, we recommend that we be retained during construction to (1) observe footing excavations prior to placement of reinforcing steel and concrete, (2) observe probing and grouting operations in foundation areas, (3) review and/or perform laboratory testing on import borrow to determine its acceptability for use in compacted fills, (4) observe structural fill placement and perform compaction testing, and (5) provide geotechnical consultation as required. Our services during construction will allow us to verify that our recommendations are properly interpreted and included in construction, and if necessary, to make modifications to those recommendations, thereby reducing construction delays in the event subsurface conditions differ from those anticipated.

### **LIMITATIONS**

The boring logs indicate the approximate subsurface soil conditions encountered only at those times and locations where our test borings were made, and may not represent conditions at other times and locations.

Hirata & Associates, Inc.

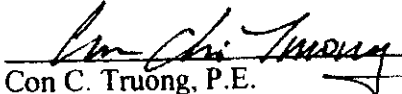
This report was prepared specifically for Mitsunaga & Associates, Inc. and their sub-consultants for design of the proposed Gymnasium and Recreation/Multi-Purpose building in Ka'u, Hawaii. The boring logs, field and laboratory test results, and recommendations presented in this report are for design purposes only, and are not intended for use in developing cost estimates by the contractor.

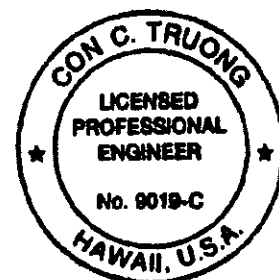
During construction, should subsurface conditions differ from those encountered in our test borings, we should be advised immediately in order to re-evaluate our recommendations, and to revise or verify them in writing before proceeding with construction.

Our recommendations and conclusions are based upon the site materials observed, the preliminary design information made available, the data obtained from our site exploration, our engineering analyses, and our experience and engineering judgement. The conclusions and recommendations are professional opinions which we have strived to develop in a manner consistent with that level of care, skill, and competence ordinarily exercised by members of the profession in good standing, currently practicing under similar conditions in the same locality. We will be responsible for those recommendations and conclusions, but will not be responsible for the interpretation by others of the information developed. No warranty is made regarding the services performed under this agreement, either express or implied.

Respectfully submitted,

HIRATA & ASSOCIATES, INC.

  
Con C. Truong, P.E.



This work was prepared by  
me or under my supervision  
Expiration Date of License:  
April 30, 2012

# **APPENDIX A**

## **FIELD INVESTIGATION**

## **DESCRIPTION OF FIELD INVESTIGATION**

### **GENERAL**

The site was explored on January 18 through 25, 2012, by performing a visual site reconnaissance and drilling 9 exploratory test borings to depths ranging from about 14.5 to 24.5 feet with a CME-55 truck-mounted drill rig. In addition, percolation tests were performed in 6 test holes.

During drilling operations, the soils were continuously logged by our field engineer and classified by visual examination in accordance with the Unified Soil Classification System. The boring and test hole logs indicate the depths at which the soils or their characteristics change, although the change could actually be gradual. For boring logs, if the change occurred between sample locations, the depth was interpreted based on field observations. Classifications and sampling intervals are shown on the boring logs. A Boring Log Legend is presented on Plate A3.1. The Unified Soil Classification and Rock Weathering Classification Systems are shown on Plates A3.2 and A3.3, respectively. The soils encountered are logged on Plates A4.1 through A4.9.

Borings and test holes were located in the field by measuring/taping offsets from existing site features shown on the plans. Surface elevations at boring and test hole locations were estimated based on a topographic survey provided by Mitsunaga and Associates, Inc. The accuracy of the boring and test hole locations shown on Plate A2.2 and the boring and test hole elevations shown on Plates A4.1 through A4.9 and A5.1 through A5.6 is therefore approximate, in accordance with the field methods used.

### **SOIL SAMPLING**

Representative soil samples and core samples of basalt were recovered from the borings for selected laboratory testing and analyses. Representative samples were

Hirata & Associates, Inc.

recovered by driving a 3-inch O.D. split tube sampler a total of 18 inches with a 140-pound hammer dropped from a height of 30 inches. The number of blows required to drive the 3-inch O.D. split tube sampler the final 12 inches are recorded at the appropriate depths on the boring logs, unless noted otherwise.

Core samples were obtained by drilling with an NX core barrel having an inside diameter of 2.1 inches. The depths and recovery percentages for each core run are shown on the enclosed Boring Logs.

The rock quality designation (RQD) for the core runs are also shown on the Boring Logs. This is a modified core recovery percentage which takes into account the number of fractures observed in the core samples. Only pieces of core 4 inches in length or longer, as measured along the centerline, were included in the determination of this modified core recovery percentage. Fractures caused by drilling or handling were ignored.

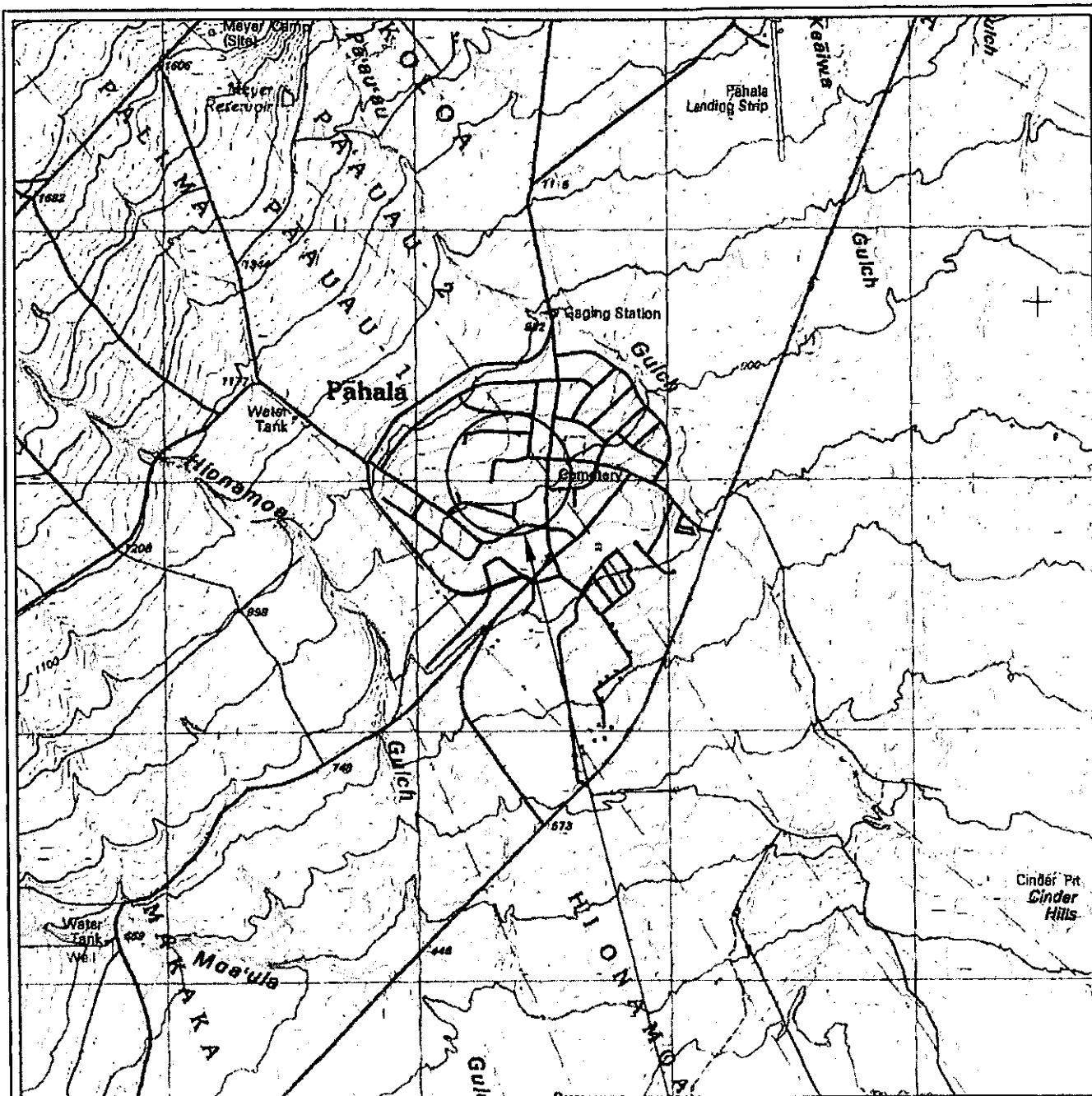
The following is a general correlation between RQD percentages and rock quality.

<u>RQD (%)</u>	<u>Description of Rock Quality</u>
0 - 25	Very Poor
25 - 50	Poor
50 - 75	Fair
75 - 90	Good
90 - 100	Excellent

Reference: Tunnel Engineering Handbook, Second Edition,  
edited by J.O. Bickel, T.R. Kuesel, and E.H. King, 1996.

## PERCOLATION TESTING

Percolation tests were performed in test holes P1 through P6 drilled to depths of about 5 feet. The approximate location of the percolation test holes are shown on Plate A2.2. Test results are presented on the Dept. of Health Site Evaluation/ Percolation Test Form, Plates A5.1 through A5.6.


























PROJECT SITE



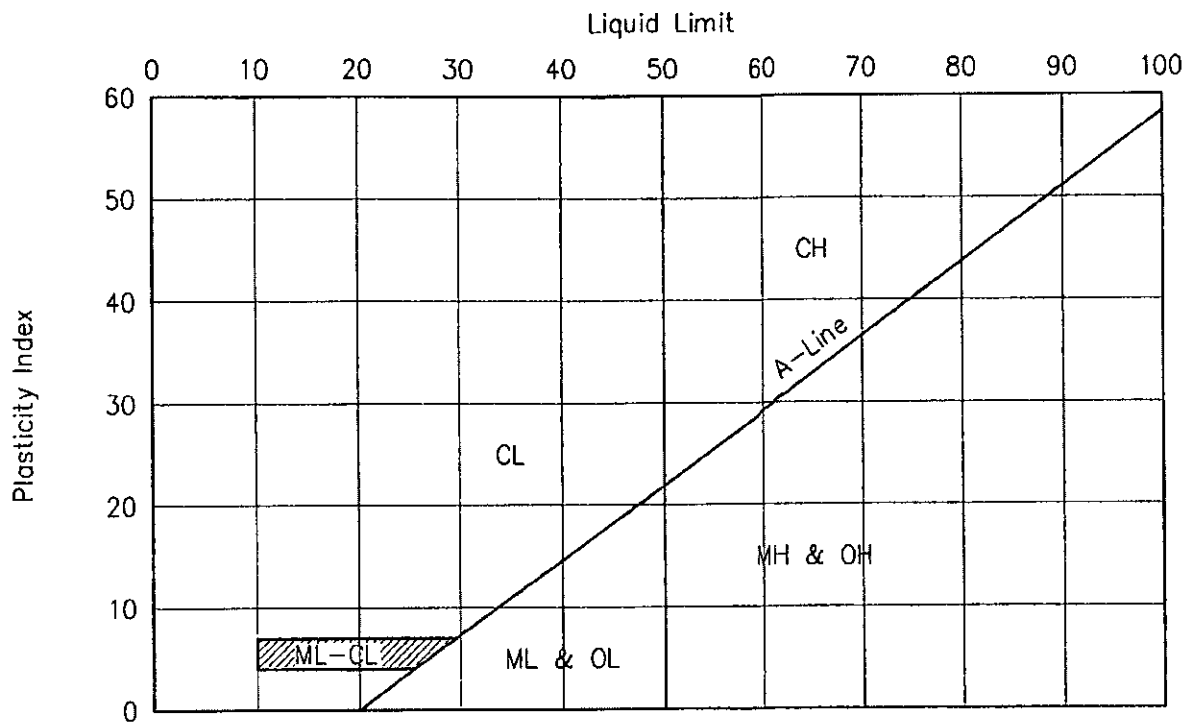
Reference: Topographic quadrangle map prepared by the United States  
Department of the Interior Geologic Survey  
Pahala Quadrangle, Hawaii County, Hawaii. 1995.



W.O. 12-5268	Ka'u Gymnasium, Pahala, Ka'u, Hawaii
Hirata & Associates, Inc.	<div>LOCATION MAP</div> <div>Plate A2.1</div>

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES	
COARSE GRAINED SOILS (More than 50% of the material is LARGER than No. 200 sieve size.)	GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size.)	CLEAN GRAVELS (Little or no fines.)	 GW	Well graded gravels, gravel-sand mixtures, little or no fines.	
			 GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.	
		GRAVELS WITH FINES (Appreciable amt. of fines.)	 GM	Silty gravels, gravel-sand-silt mixtures.	
			 GC	Clayey gravels, gravel-sand-clay mixtures.	
	SANDS (More than 50% of coarse fraction is SMALLER than the No. 4 sieve size.)	CLEAN SANDS (Little or no fines.)	 SW	Well graded sands, gravelly sands, little or no fines.	
			 SP	Poorly graded sands or gravelly sands, little or no fines.	
		SANDS WITH FINES (Appreciable amt. of fines.)	 SM	Silty sands, sand-silt mixtures.	
			 SC	Clayey sands, sand-clay mixtures.	
FINE GRAINED SOILS (More than 50% of the material is SMALLER than No. 200 sieve size.)	SILTS AND CLAYS (Liquid limit LESS than 50.)		 ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.	
			 CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.	
			 OL	Organic silts and organic silty clays of low plasticity.	
	SILTS AND CLAYS (Liquid limit GREATER than 50.)		 MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.	
			 CH	Inorganic clays of high plasticity, fat clays.	
			 OH	Organic clays of medium to high plasticity, organic silts.	
		HIGHLY ORGANIC SOILS		 PT	Peat and other highly organic soils.
					FRESH TO MODERATELY WEATHERED BASALT
			VOLCANIC TUFF / HIGHLY TO COMPLETELY WEATHERED BASALT		
			CORAL		
SAMPLE DEFINITION					
 2" O.D. Standard Split Spoon Sampler		 Shelby Tube		RQD Rock Quality Designation	
 3" O.D. Split Tube Sampler		 NX / 4" Coring			
				Water Level	
W.O. 12-5268		Ka'u Gymnasium, Pahala, Ka'u, Hawaii			
Hirata & Associates, Inc.		BORING LOG LEGEND			
Plate A3.1					

# PLASTICITY CHART



# GRADATION CHART

COMPONENT DEFINITIONS BY GRADATION	
COMPONENT	SIZE RANGE
Boulders	Above 12 in.
Cobbles	3 in. to 12 in.
Gravel	3 in. to No. 4 (4.76 mm)
Coarse gravel	3 in. to 3/4 in.
Fine gravel	3/4 in. to No. 4 (4.76 mm)
Sand	No. 4 (4.76 mm) to No. 200 (0.074 mm)
Coarse sand	No. 4 (4.76 mm) to No. 10 (2.0 mm)
Medium sand	No. 10 (2.0 mm) to No. 40 (0.42 mm)
Fine sand	No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt and clay	Smaller than No. 200 (0.074 mm)

W.O. 12-5268

Ka'u Gymnasium, Pahala, Ka'u, Hawaii

Hirata & Associates, Inc.

UNIFIED SOIL CLASSIFICATION SYSTEM

Plate A3.2

<u>Grade</u>	<u>Symbol</u>	<u>Description</u>
Fresh	F	No visible signs of decomposition or discoloration. Rings under hammer impact.
Slightly Weathered	WS	Slight discoloration inwards from open fractures, otherwise similar to F.
Moderately Weathered	WM	Discoloration throughout. Weaker minerals such as feldspar decomposed. Strength somewhat less than fresh rock but cores cannot be broken by hand or scraped by knife. Texture preserved.
Highly Weathered	WH	Most minerals somewhat decomposed. Specimens can be broken by hand with effort or shaved with knife. Core stones present in rock mass. Texture becoming indistinct but fabric preserved.
Completely Weathered	WC	Minerals decomposed to soil but fabric and structure preserved (Saprolite). Specimens easily crumbled or penetrated.
Residual Soil	RS	Advanced state of decomposition resulting in plastic soils. Rock fabric and structure completely destroyed. Large volume change.

Reference: Soils Mechanics, NAVFAC DM-7.1, Department of the Navy, Naval Facilities Engineering Command, September, 1986.

W.O. 12-5268	Ka'u Gymnasium, Pahala, Ka'u, Hawaii
Hirata & Associates, Inc.	<b>ROCK WEATHERING CLASSIFICATION SYSTEM</b> Plate A3.3

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 12-5268

BORING NO. B1 DRIVING WT. 140 lb. START DATE 1/19/12  
 SURFACE ELEV. 921± DROP 30 in. END DATE 1/19/12

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0			18/6"	50	32	Clayey SILT (MH) - Brown, moist, with sand. (Volcanic Ash)
			10/No Penetration			BASALT (WS-WM) - Gray, medium hard to hard, vesicular, fractured, slight to moderately weathered.
			10/No Penetration			
5			10/No Penetration			Begin NX Coring at 5 feet. 100% Recovery from 5 to 9.5 feet. RQD = 78%
10						43% Recovery from 9.5 to 14.5 feet. RQD = 31% Cavity at 11 to 14 feet.
15						End boring at 14.5 feet.
						Neither groundwater nor seepage water encountered.
20						* Elevations based on site plan provided by Mitsunaga & Associates, Inc.
25						
30						

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 12-5268

BORING NO. B2 DRIVING WT. 140 lb. START DATE 1/19/12  
 SURFACE ELEV. 923± DROP 30 in. END DATE 1/19/12

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Clayey SILT (MH) - Brown, slightly moist, with sand. (Volcanic Ash)
			10/No Penetration			BASALT (WS-WM) - Gray, medium hard to hard, vesicular, fractured, slight to moderately weathered.
			10/No Penetration			
5						Begin NX Coring at 5 feet. 100% Recovery from 5 to 9.5 feet. RQD = 59%
10						100% Recovery from 9.5 to 14.5 feet. RQD = 78%
15						End boring at 14.5 feet.
20						Neither groundwater nor seepage water encountered.
25						
30						

# HIRATA & ASSOCIATES, INC.

## BORING LOG

W.O. 12-5268

BORING NO. B3 DRIVING WT. 140 lb. START DATE 1/25/12  
 SURFACE ELEV. 920.5± DROP 30 in. END DATE 1/25/12

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Clayey SILT (MH) - Brown, moist, with sand. (Volcanic Ash)
			10/6"	63	28	
			25/3"			
			10/No Penetration			
5						BASALT (WS-WM) - Gray, medium hard to hard, vesicular, fractured, slight to moderately weathered.  Begin NX Coring at 5 feet. 100% Recovery from 5 to 9.5 feet. RQD = 84%
10						97% Recovery from 9.5 to 14.5 feet. RQD = 84%
15						100% Recovery from 14.5 to 19.5 feet. RQD = 90%
20						100% Recovery from 19.5 to 24.5 feet. RQD = 100%
25						End boring at 24.5 feet.  Neither groundwater nor seepage water encountered.
30						

Plate A4.3

# HIRATA & ASSOCIATES, INC.

## BORING LOG

W.O. 12-5268

BORING NO. B4 DRIVING WT. 140 lb. START DATE 1/18/12  
 SURFACE ELEV. 923.5± DROP 30 in. END DATE 1/18/12

DEPTH FOOT	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0			25/6" 20/4"	52	54	Clayey SILT (MH) - Brown, moist, with sand. (Volcanic Ash)
5			10/No Penetration 10/No Penetration			BASALT (WS-WM) - Gray, medium hard to hard, vesicular, fractured, slight to moderately weathered.  Begin NX Coring at 5 feet. 100% Recovery from 5 to 9.5 feet. RQD = 80%  97% Recovery from 9.5 to 14.5 feet. RQD = 65%  100% Recovery from 14.5 to 19.5 feet RQD = 80%  100% Recovery from 19.5 to 24.5 feet. RQD = 82%
25						End boring at 24.5 feet.  Neither groundwater nor seepage water encountered.
30						

Plate A4.4

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 12-5268

BORING NO. B5 DRIVING WT. 140 lb. START DATE 1/19/12  
 SURFACE ELEV. 915± DROP 30 in. END DATE 1/19/12

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Clayey SILT (MH) - Brown, moist, with sand. (Volcanic Ash)
			15	47	31	
			4/6"	63	42	
5			10/No Penetration			BASALT (WS-WM) - Gray, medium hard to hard, vesicular, fractured, slight to moderately weathered. Begin NX Coring at 5 feet. 96% Recovery from 5 to 9.5 feet. RQD = 44%
10			10/No Penetration			100% Recovery from 9.5 to 14.5 feet. RQD = 57%
15						95% Recovery from 14.5 to 19.5 feet. RQD = 72%
20						End boring at 19.5 feet.
25						Neither groundwater nor seepage water encountered.
30						

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 12-5268

BORING NO. B6 DRIVING WT. 140 lb. START DATE 1/23/12  
 SURFACE ELEV. 919.5± DROP 30 in. END DATE 1/23/12

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0			11/6"	63	12	Clayey SILT (MH) - Brown, slightly moist, with sand. (Volcanic Ash)
			17/3"			
			10/No Penetration			BASALT (WS-WM) - Gray, medium hard to hard, vesicular, fractured, slight to moderately weathered.
5			10/No Penetration			Begin NX Coring at 5 feet. 100% Recovery from 5 to 9.5 feet. RQD = 67%
10						100% Recovery from 9.5 to 14.5 feet. RQD = 77%
15						100% Recovery from 14.5 to 19.5 feet. RQD = 88%
20						End boring at 19.5 feet.
25						Neither groundwater nor seepage water encountered.
30						

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 12-5268

BORING NO. B7 DRIVING WT. 140 lb. START DATE 1/18/12  
 SURFACE ELEV. 912.5± DROP 30 in. END DATE 1/18/12

DEPTH FOOT	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Clayey SILT (MH) - Brown, moist, with sand. (Volcanic Ash)
4			10/No Penetration			BASALT (WS-WM) - Gray, medium hard to hard, vesicular, fractured, slight to moderately weathered.
5			10/No Penetration			Begin NX Coring at 4 feet. 100% Recovery from 4 to 9 feet. RQD = 55%
10						100% Recovery from 9 to 14 feet. RQD = 85%
15						100% Recovery from 14 to 19 feet. RQD = 28%
20						90% Recovery from 19 to 24 feet. RQD = 80%
25						End boring at 24 feet.
30						Neither groundwater nor seepage water encountered.

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 12-5268

BORING NO. B8 DRIVING WT. 140 lb. START DATE 1/18/12  
 SURFACE ELEV. 915± DROP 30 in. END DATE 1/18/12

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Clayey SILT (MH) - Brown, moist, with sand. (Volcanic Ash)
			10/No Penetration			BASALT (WS-WM) - Gray, medium hard to hard, vesicular, fractured, slight to moderately weathered.
			10/No Penetration			
5						Begin NX Coring at 5 feet. 100% Recovery from 5 to 9.5 feet. RQD = 62%
10						100% Recovery from 9.5 to 14.5 feet. RQD = 60%
15						100% Recovery from 14.5 to 19.5 feet. RQD = 93%
20						100% Recovery from 19.5 to 24.5 feet. RQD = 97%
25						End boring at 24.5 feet.
30						Neither groundwater nor seepage water encountered.

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 12-5268

BORING NO. B9 DRIVING WT. 140 lb. START DATE 1/18/12  
 SURFACE ELEV. 917.5± DROP 30 in. END DATE 1/18/12

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Clayey SILT (MH) - Brown, moist, with sand, gravel, and cobbles. (Volcanic Ash)
			7/6"			
			14/3"	54	21	
			10/No Penetration			
			6/6"	37	67	
			15/11"			
5			10/No Penetration			BASALT (WS-WM) - Gray, medium hard to hard, vesicular, fractured, slight to moderately weathered. Begin NX Coring at 5 feet. 100% Recovery from 5 to 9.5 feet. RQD = 70%
10						100% Recovery from 9.5 to 14.5 feet. RQD = 80%
15						100% Recovery from 14.5 to 19.5 feet. RQD = 90%
20						100% Recovery from 19.5 to 24.5 feet. RQD = 100%
25						End boring at 24.5 feet.  Neither groundwater nor seepage water encountered.
30						

# SITE EVALUATION/PERCOLATION TEST

Date/Time: January 25, 2012 / 11:50 am  
 Test performed by: Hirata & Associates, Inc.  
 Owner: State of Hawaii  
 Tax Map Key: 9-6-05: 08 and 39  
 Test Number: P1

Elevation: 923.5± ft.  
 Depth to Groundwater Table: >5 ft. below grade  
 Depth to Bedrock (if observed): 1.5 ft. below grade  
 Diameter of Hole: 4 in.  
 Depth to Hole Bottom: 5 ft. below grade

Depth (inches)	Soil Profile (Color, texture, other)
0 - 18	Brown clayey silt
18 - 60	Gray basalt

## PERCOLATION READINGS

Time 12 inches of water to seep away: \_\_\_\_\_ min.  
 Time 12 inches of water to seep away: \_\_\_\_\_ min.

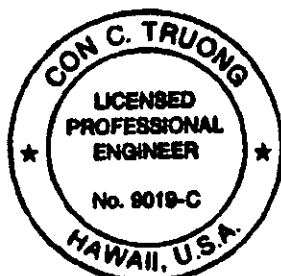
\_\_\_ For percolation tests in sandy soils, record time intervals and water drops every 10 minutes for at least 1 hour.

\_\_\_ For percolation tests in non-sandy soils, presoak the test hole for at least 4 hours. Record time intervals and water drops at least every 10 minutes for 1 hour; or if the time for the first 6 inches to seep away is greater than 30 minutes, record time intervals and water drops at least every 30 minutes for 4 hours or until 2 successive drops do not vary by more than 1/16 inch.

Time interval	Drop in inches	Time interval	Drop in inches
10 min.	2.43	10 min.	2.19
10 min.	1.69	10 min.	1.88
10 min.	9.06	20 min.	4.56
10 min.	3.06	50 min.	11.5
10 min.	3.06	30 min.	5.13
10 min.	3.00	30 min.	3.5

Percolation Rate (time/final water level drop): 8.5 min/in

As the engineer responsible for gathering and providing site information and percolation test results, I attest to the fact that above site information is accurate and that the site evaluation was conducted in accordance with the provisions of Chapter 11-62, "Wastewater Systems" and the results were acceptable



Con C. Truong  
 Engineer's Signature/Stamp

# **SITE EVALUATION/PERCOLATION TEST**

Date/Time: January 25, 2012 / 11:45 am  
 Test performed by: Hirata & Associates, Inc.  
 Owner: State of Hawaii  
 Tax Map Key: 9-6-05: 08 and 39  
 Test Number: P2

Elevation: 915.5± ft.  
 Depth to Groundwater Table: >5 ft. below grade  
 Depth to Bedrock (if observed): 3.5 ft. below grade  
 Diameter of Hole: 4 in.  
 Depth to Hole Bottom: 5 ft. below grade

Depth (Inches)	Soil Profile (Color, texture, other)
0 - 42	Brown clayey silt
42 - 60	Gray basalt

## **PERCOLATION READINGS**

Time 12 inches of water to seep away: \_\_\_\_\_ min.  
 Time 12 inches of water to seep away: \_\_\_\_\_ min.

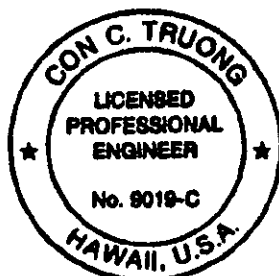
\_\_\_ For percolation tests in sandy soils, record time intervals and water drops every 10 minutes for at least 1 hour.

\_\_\_ For percolation tests in non-sandy soils, presoak the test hole for at least 4 hours. Record time intervals and water drops at least every 10 minutes for 1 hour; or if the time for the first 6 inches to seep away is greater than 30 minutes, record time intervals and water drops at least every 30 minutes for 4 hours or until 2 successive drops do not vary by more than 1/16 inch.

Time interval	Drop in inches	Time interval	Drop in inches
10 min.	0.38	40 min.	2.88
10 min.	0.38	30 min.	1.63
10 min.	0.25	20 min.	4.56
10 min.	0.13	50 min.	11.5
30 min.	0.75	30 min.	5.13
75 min.	18.81	30 min.	3.5

Percolation Rate (time/final water level drop): 18.5 min/in

As the engineer responsible for gathering and providing site information and percolation test results, I attest to the fact that above site information is accurate and that the site evaluation was conducted in accordance with the provisions of Chapter 11-62, "Wastewater Systems" and the results were acceptable.



Con C. Truong  
 Engineer's Signature/Stamp

# **SITE EVALUATION/PERCOLATION TEST**

Date/Time: January 25, 2012 / 11:50 am  
 Test performed by: Hirata & Associates, Inc.  
 Owner: State of Hawaii  
 Tax Map Key: 9-6-05: 08 and 39  
 Test Number: P3

Elevation: 919± ft.  
 Depth to Groundwater Table: >5 ft. below grade  
 Depth to Bedrock (if observed): 1.5 ft. below grade  
 Diameter of Hole: 4 in.  
 Depth to Hole Bottom: 5 ft. below grade

Depth (inches)	Soil Profile (Color, texture, other)
0 - 18	Brown clayey silt
18 - 60	Gray basalt

## **PERCOLATION READINGS**

Time 12 inches of water to seep away: \_\_\_\_\_ min.  
 Time 12 inches of water to seep away: \_\_\_\_\_ min.

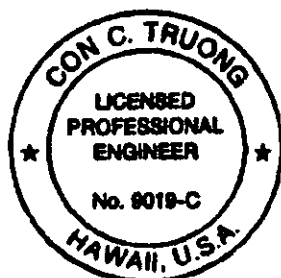
\_\_\_ For percolation tests in sandy soils, record time intervals and water drops every 10 minutes for at least 1 hour.

\_\_\_ For percolation tests in non-sandy soils, presoak the test hole for at least 4 hours. Record time intervals and water drops at least every 10 minutes for 1 hour; or if the time for the first 6 inches to seep away is greater than 30 minutes, record time intervals and water drops at least every 30 minutes for 4 hours or until 2 successive drops do not vary by more than 1/16 inch.

Time interval	Drop in inches	Time interval	Drop in inches
10 min.	0.63		
10 min.	0.56		
10 min.	0.50		
30 min.	2.06		
30 min.	2.25		
70 min.	3.0		

Percolation Rate (time/final water level drop): 23 min/in

As the engineer responsible for gathering and providing site information and percolation test results, I attest to the fact that above site information is accurate and that the site evaluation was conducted in accordance with the provisions of Chapter 11-62, "Wastewater Systems" and the results were acceptable



Con C. Truong  
 Engineer's Signature/Stamp

# **SITE EVALUATION/PERCOLATION TEST**

Date/Time: January 25, 2012 / 11:50 am  
 Test performed by: Hirata & Associates, Inc.  
 Owner: State of Hawaii  
 Tax Map Key: 9-6-05: 08 and 39  
 Test Number: P5

Elevation: 916.5± ft.  
 Depth to Groundwater Table: >5 ft. below grade  
 Depth to Bedrock (if observed): >5 ft. below grade  
 Diameter of Hole: 4 in.  
 Depth to Hole Bottom: 5 ft. below grade

Depth (inches)	Soil Profile (Color, texture, other)
0 - 30	Brown clayey silt
30 - 60	Gray basalt gravel and cobbles

## **PERCOLATION READINGS**

Time 12 inches of water to seep away: \_\_\_\_\_ min.  
 Time 12 inches of water to seep away: \_\_\_\_\_ min.

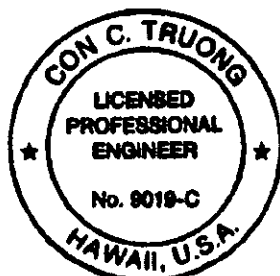
\_\_\_ For percolation tests in sandy soils, record time intervals and water drops every 10 minutes for at least 1 hour.

\_\_\_ For percolation tests in non-sandy soils, presoak the test hole for at least 4 hours. Record time intervals and water drops at least every 10 minutes for 1 hour; or if the time for the first 6 inches to seep away is greater than 30 minutes, record time intervals and water drops at least every 30 minutes for 4 hours or until 2 successive drops do not vary by more than 1/16 inch.

Time interval	Drop in inches	Time interval	Drop in inches
10 min.	1.25	10 min.	0.5
10 min.	0.75	10 min.	0.44
10 min.	1.0	10 min.	0.75
10 min.	1.88	10 min.	0.81
10 min.	1.44	20 min.	2.38
10 min.	1.19	30 min.	1.81

Percolation Rate (time/final water level drop): 16.5 min/in

As the engineer responsible for gathering and providing site information and percolation test results, I attest to the fact that above site information is accurate and that the site evaluation was conducted in accordance with the provisions of Chapter 11-62, "Wastewater Systems" and the results were acceptable.



Con C. Truong  
 Engineer's Signature/Stamp

# SITE EVALUATION/PERCOLATION TEST

Date/Time: January 25, 2012 / 11:55 am  
 Test performed by: Hirata & Associates, Inc.  
 Owner: State of Hawaii  
 Tax Map Key: 9-6-05: 08 and 39  
 Test Number: P6

Elevation: 915± ft.  
 Depth to Groundwater Table: >5 ft. below grade  
 Depth to Bedrock (if observed): >5 ft. below grade  
 Diameter of Hole: 4 in.  
 Depth to Hole Bottom: 5 ft. below grade

Depth (inches)	Soil Profile (Color, texture, other)
0 - 12	Brown clayey silt
12 - 60	Gray basalt gravel and cobbles

## PERCOLATION READINGS

Time 12 inches of water to seep away: \_\_\_\_\_ min.  
 Time 12 inches of water to seep away: \_\_\_\_\_ min.

\_\_\_ For percolation tests in sandy soils, record time intervals and water drops every 10 minutes for at least 1 hour.

\_\_\_ For percolation tests in non-sandy soils, presoak the test hole for at least 4 hours. Record time intervals and water drops at least every 10 minutes for 1 hour, or if the time for the first 6 inches to seep away is greater than 30 minutes, record time intervals and water drops at least every 30 minutes for 4 hours or until 2 successive drops do not vary by more than 1/16 inch.

Time interval	Drop in inches	Time interval	Drop in inches
10 min.	3.0		
10 min.	1.38		
10 min.	2.06		
10 min.	3.94		
10 min.	1.19		
10 min.	1.19		

Percolation Rate (time/final water level drop): 8.4 min/in

As the engineer responsible for gathering and providing site information and percolation test results, I attest to the fact that above site information is accurate and that the site evaluation was conducted in accordance with the provisions of Chapter 11-62, "Wastewater Systems" and the results were acceptable



Con C. Truong  
 Engineer's Signature/Stamp

# **APPENDIX B**

## **LABORATORY TESTING**

## **DESCRIPTION OF LABORATORY TESTING**

### **CLASSIFICATION**

Field classification was verified in the laboratory in accordance with the Unified Soil Classification System. Laboratory classification was determined by visual examination. The final classifications are shown at the appropriate locations on the Boring Logs, Plates A4.1 through A4.9.

### **MOISTURE-DENSITY**

Representative samples were tested for field moisture content and dry unit weight. The dry unit weight was determined in pounds per cubic foot while the moisture content was determined as a percentage of dry weight. Samples were obtained using a 3-inch O.D. split tube sampler. Test results are shown at the appropriate depths on the Boring Logs, Plates A4.1 through A4.9.

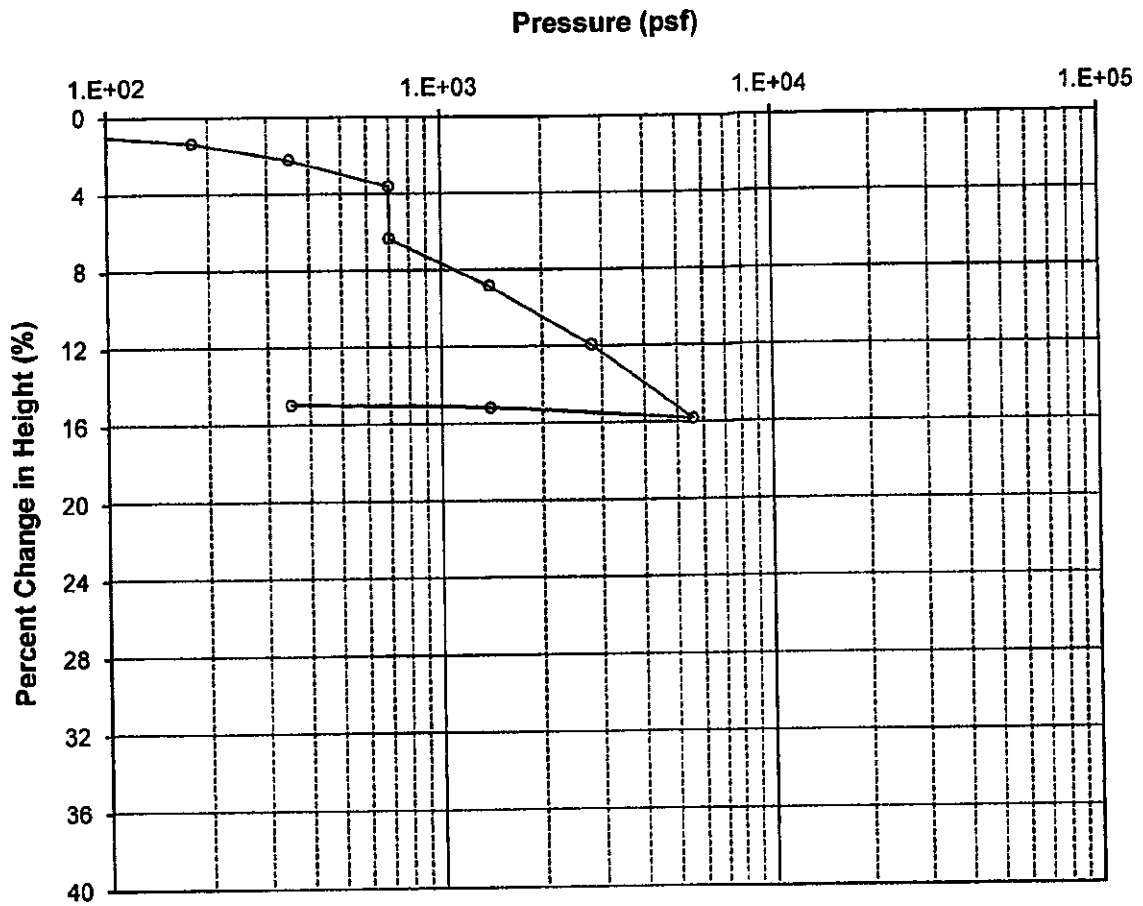
### **CONSOLIDATION**

A representative soil sample was tested for its consolidation characteristics. The test sample was 2.42 inches in diameter and 1 inch high. Porous stones were placed in contact with the top and bottom of the test sample to permit addition and release of pore fluid. Loads were then applied in several increments in a geometric progression, and the resulting deformations recorded at selected time intervals. Test results are plotted on the Consolidation Test Report, Plate B2.1.

### **CALIFORNIA BEARING RATIO TESTS**

CBR tests were performed on bag samples of near surface soil. The tests were performed on samples compacted to the soil's maximum wet density at its insitu moisture content. Results are shown on Plates B3.1 and B3.2.

# Consolidation Test Results



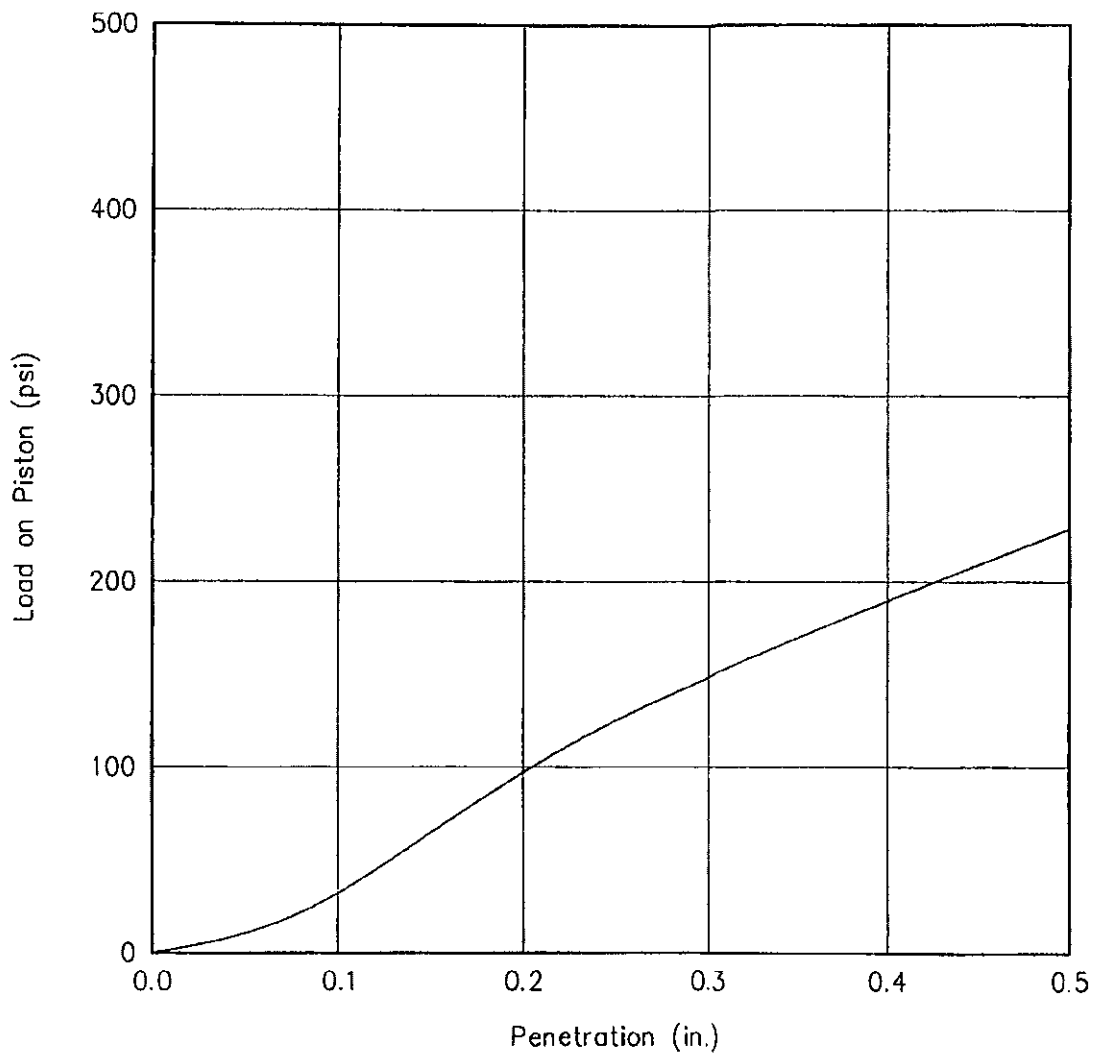
## Sample Description

Boring No.: B5    Depth (ft)    1  
 Soil Description: Brown clayey silt

	Moisture Content (%)	Dry Density (pcf)
Initial	31.0	46.7
Final	75.7	54.9

Remark: 02/15/12, water added at 700 psf

<b>W.O. 12-5268</b>	<b>Ka'u Gymnasium, Pahala, Ka'u, Hawaii</b>
<b>Hirata &amp; Associates, Inc.</b>	<b>CONSOLIDATION TEST</b>



Soil Data

Location: P2 at 0.5 to 1.5 ft  
Description: Brown clayey silt  
Sample Dry Density: 69 pcf  
Sample Moisture Content: 48%

Test Results

CBR Value: 3.1%  
Expansion: 1.3%

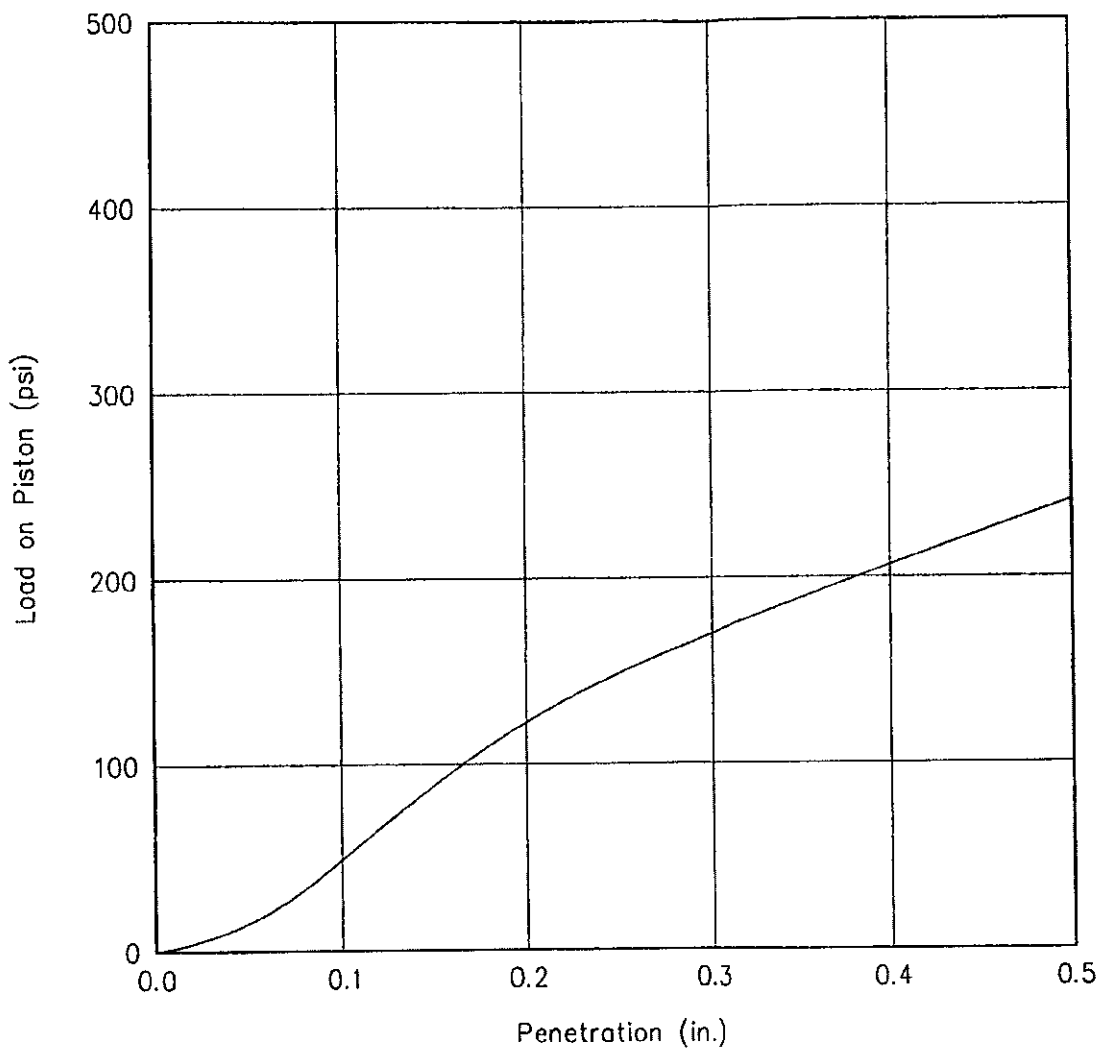
W.O. 12-5268

Ka'u Gymnasium, Pahala, Ka'u, Hawaii

Hirata & Associates, Inc.

CBR STRESS PENETRATION CURVE

Plate B3.1



#### Soil Data

Location: P4 at 0.5 to 2 ft  
 Description: Brown clayey silt  
 Sample Dry Density: 65.5 pcf  
 Sample Moisture Content: 51%

#### Test Results

CBR Value: 4.9%  
 Expansion: 1.6%

W.O. 12-5268

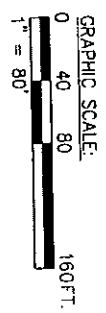
Ka'u Gymnasium, Pahala, Ka'u, Hawaii

Hirata & Associates, Inc.

**CBR STRESS PENETRATION CURVE**

Plate B3.2

Approximate location of borings  
 Approximate location of percultion test holes  
 Reference: Site Plan provided by Mitsunaga & Associates, Inc.



W.O. 12-5268	Ka'u Gymnasium, Pahala, Ka'u, Hawaii
Hirata & Associates, Inc.	<b>BORING LOCATION PLAN</b>
	Plate A2.2

